

For the purposes of the new institution the governing body should have the entire disposal of the accommodation provided by the Royal College of Science, including the buildings in course of construction at South Kensington, the Central Technical College, and all buildings which may be erected on the additional site at South Kensington.

The site and buildings of the Royal College of Science, including the buildings in course of construction, should either remain the property of His Majesty's Government or be transferred to the governing body of the new institution, as His Majesty's Government may determine.

The site and buildings of the Central Technical College should, if and so long as they desire it, remain the property of the City and Guilds of London Institute, who should provide for their maintenance and repair.

The governing body should be incorporated, and subject to such special provisions as may be made by their instrument of incorporation they should receive and expend fees and other funds which may be assigned to the purposes of the new institution, they should appoint the professors and the other members of the staff, they should determine the departments and subjects of instruction, they should control the arrangement of the courses of instruction, and the award of diplomas, and they should make provision for the protection of students now in the constituent institutions and of the existing diplomas. Further, in each of the departments of the new institution the governing body should appoint a board, not necessarily consisting of members of their own body, and including members of the teaching staff and persons with practical experience of industrial requirements, to give expert advice with regard to such particulars connected with that department as the governing body may refer to them.

We recommend that it be an instruction to the governing body to enter into negotiations with the University of London, with King's College, and pending its actual incorporation, with University College, with regard to the coordination of the engineering work of these colleges with that of the new institution. We recommend that instruction in the higher branches of technology should, as far as possible, be concentrated at South Kensington. In the establishment of new departments we do not think it will be possible at present to go much beyond the various branches of engineering, with mining and metallurgy, though we hope provision may be made later for other subjects. We think the principal technical and engineering societies should be consulted as to the departments most requiring development and expansion, and as to the number of students for whom it is desirable to make provision in each department. In view of the character of the subjects which will, it may be expected, predominate on the South Kensington site, it must, we think, before long become a question whether the biological department of the Royal College of Science shall be retained there. As soon as this question becomes ripe for settlement, the provision to be made for that department will be a matter for negotiation.

We think that it may be found possible, even in the immediate future, to make arrangements for the establishment of departments dealing adequately with the greater number of special sections of applied science named. Thus it would seem that certain of these departments might be accommodated in the buildings of existing London institutions, while, for others, special accommodation would fall to be provided at once in the first additions to the buildings already available on the South Kensington site. For example, in view of the character and standard of the work now carried out by the Central Technical College, we think prominence should be given in the new institution to certain specialised developments of mechanical and electrical engineering.

We have already reported that we think a fully equipped central school of mines should be maintained, providing a full course of instruction in mining and metallurgy, especially in the mining and metallurgy of metals produced in India and the Colonies, but not found in workable quantities in the United Kingdom.

It should be borne in mind that the traditions and prestige of the Royal School of Mines and the association of that school are valuable assets, and we think care should be taken to preserve those traditions and that diploma.

In our opinion, accommodation should be provided in this department for 100 to 120 fully qualified students, *i.e.* fifty or sixty entries in each of the two years contemplated, so that forty to fifty students might be expected to pass out each year after successfully completing the course.

Vacation work under the guidance of school authorities, in districts where practical work is conducted, is a great and valuable feature of American and Canadian schools of mines. We think it would be advantageous for students of the Royal School of Mines to have one short period of practical mine surveying and of mining work generally, in a metalliferous mine, and another similar period of experience of the work of a coal mine.

No student should be admitted to any specialised technical department who has not received, either in the new institution itself or elsewhere, an adequate training of a technical and scientific character such as should be common to every branch of engineering. He should have spent two years on a course of instruction in science, such as he could obtain in a well organised college or technical institution, after having reached the standard of general education usually marked by university matriculation. An examination test should be imposed on all candidates for admission to the higher departments, except in the case of students who show, by some recognised qualification, that they have received the necessary preliminary training, and when there are more candidates for admission to a particular department than can be received, the best should be selected on a competitive basis.

The preliminary training to be given in the new institution should be of the kind which has just been referred to. It should consist of a course of two years' instruction in science, technology, and engineering, of such a character as the governing body consider the most suitable preparation for the specialised courses, and it should be, in the main, common to all students proceeding to advanced instruction in any department. We have already indicated our opinion that students who have not attained a certain standard of general education are not fitted to obtain the fullest advantage from the specialised instruction of the higher departments. We therefore think that evidence of this should be required before admission to the preliminary department.

NOTES.

SIR ALEXANDER B. W. KENNEDY, F.R.S., has been elected a member of the Athenæum Club under the provisions of the rule which empowers the annual election by the committee of three persons "of distinguished eminence in science, literature, the arts, or for public services."

PROF. ALBRECHT PENCK, of Vienna, has accepted the professorship of geography in the University of Berlin, vacant by the death of Prof. von Richthofen.

THE Nichols medal of the American Chemical Society for the year 1905 has been awarded to Prof. Marston Taylor Bogert, of Columbia University, for his researches on the quinazolines.

Science announces that Dr. C. D. Walcott has resigned the secretaryship of the board of the Carnegie Institution at Washington, and is succeeded by Mr. Cleveland H. Dodge.

A MEMORIAL tablet has been unveiled on the house, in Eisenach, in which the late director of Zeiss's works, Prof. Abbe, was born.

ARRANGEMENTS have been made to hold a hygiene exhibition in Dresden in the year 1909 under the directorship of Dr. Lingner.

FROM Tübingen the death is announced, on January 25, of Prof. W. Mayer, the director of the university pharmacological museum, and a member of the pharmaceutical examinations commission.

WE learn from *Science* that, in accordance with the recommendations of Prof. John B. Smith, a Bill has been introduced into the New Jersey Legislature appropriating 14,000*l.* a year for five years for the extermination of mosquitoes.

A REUTER message from Naples states that Vesuvius is still active. The lava has reached three places on the Vesuvian railway line, covering about 100 yards of the line at each point. The lava threatens the line at a fourth point, as well as the station of the funicular railway, which is no longer working.

THE Friday evening discourse at the Royal Institution on February 16 will be delivered by Mr. W. C. D. Whetham on "The Passage of Electricity through Liquids," and on February 23 by Prof. J. O. Arnold on the "Internal Architecture of Metals."

A GREAT mass of rock having a weight estimated at 70,000 tons at the lowest, and placed by some at half a million tons, fell at Cheddar Cliffs on Sunday night. The fall took place on the face of the cliff, and the disaster is attributed to quarrying operations.

THE *Electrician* states that the forty-fourth Congrès de Sociétés savantes will be opened at the Sorbonne on Tuesday, April 17. The congress will continue until Friday, April 20, and on the following day it will be concluded by a meeting in the great amphitheatre of the Sorbonne, presided over by the Minister of Public Instruction and the Fine Arts.

DR. LEWIS GOUGH has been appointed to assist Dr. Gunning in the management of the museum at Pretoria. The department for which he will be responsible will be that containing the fishes, the amphibia, and reptiles—groups of animals which were especially under his charge when he was an assistant in the museum at Strasburg. Recently Dr. Gough has been working at Plymouth on the plankton of the British Channel in connection with the British Marine Biological Association.

A SECTION of the Swedish Government is again anxious to impose an export duty on outgoing Swedish iron ores. A suggested duty of 20 öre per ton is desired, whilst the revenue accruing therefrom is to be applied to furthering the cause of the Swedish iron industry.

ON January 30 Mr. W. H. Cope, librarian to the University of Birmingham, was presented with an oak clock and a cheque by Prof. J. H. Poynting, F.R.S., on behalf of a number of present and past members of Mason College and of the University, on the twenty-fifth anniversary of Mr. Cope's appointment as librarian.

THE friends and pupils of the late Prof. A. Hilger, professor of pharmacy in the University of Munich, have decided to perpetuate his memory in the university town of Erlangen, the seat of his activity for many years. It is proposed to erect a handsome monument to the deceased man of science in the palace garden in front of Hilger's former laboratory. Communications and contributions are to be addressed to Dr. Späth, chief inspector of the Royal Analytical Institute, Erlangen.

THE twenty-fifth anniversary of the foundation of the Berlin Agricultural High School was celebrated on January 25; among those present were a number of relatives of the late Albrecht von Thaers, who is regarded as the reformer of agricultural teaching and of the science of practical agriculture in Germany. The rector of the

school, Prof. Orth, chose as the title of his address "Agriculture up to the Time of Thaers."

WE learn from the *Times* that Sir Robert L. Patterson, who died at his residence near Belfast on January 29, was the second son of the late Mr. Robert Patterson, F.R.S. He was a member of the British Ornithologists' Union, and recognised as a high authority on Irish birds. For very many years he was associated with the Belfast Natural History and Philosophical Society, of which he was twice president for terms of two years each, in 1881 and 1894. He also took an active interest in the Ulster Fisheries Biology Association, of which he was a life member and a vice-president. He was a Fellow of the Linnean Society of London.

WE regret to record the death, in his forty-seventh year, of Mr. C. J. Cornish on January 30. Educated at Charterhouse and Hertford College, Oxford (of which he was a Fellow), Mr. Cornish at the conclusion of his college career was appointed an assistant master at St. Paul's School, a position he held until his death. He was the author of a number of articles in the *Spectator*, as well as of several books, bearing more or less closely on the popular side of natural history, and his innate love of nature, coupled with an agreeable style, made all his works a success. Among his best known books may be mentioned "Life at the Zoo" (1895), "Nights with an Old Gunner" (1897), and "The Naturalist on the Thames." In addition to these, he was editor of the "Living Animals of the World," published in parts by Messrs. Hutchinson, and was commissioned to write the "Life of Sir William Flower" by the relatives of that distinguished zoologist.

IN Natal, where a local committee has been formed to cooperate with the Imperial Cancer Research Fund (says the *British Medical Journal*), the question of the occurrence of malignant disease among such coloured races as inhabit the colony, and also among the lower animals, birds, fish, and reptiles, is being actively investigated. So far as is possible, the assistance of all practitioners of human and veterinary medicine has been secured, and endeavour has likewise been made to enlist the sympathies of naturalists and sportsmen. All specimens of suspected cancerous disease are being examined at the Government Laboratory, Pietermaritzburg, free of charge. The honorary secretary of the committee is Dr. W. Watkins-Pitchford.

SIR JAMES CRICHTON-BROWNE presided over the twenty-third annual dinner of the Sanitary Inspectors' Association on February 3. Sir W. Broadbent gave the toast of "Science and Art," and testified to the zeal with which sanitary inspectors discharged their duties in the battle against disease. The president, in proposing the toast of the "Sanitary Inspectors' Association," referred to the recent suggestions of Sir F. Treves that disease is beneficent, and passed on to consider the important work carried out by sanitary inspectors. The ravages of tuberculosis were particularly referred to as an example of the striking effects of sanitary reform. Sixty-seven years ago pulmonary consumption was annually killing 68,000 persons in England and Wales, or 3800 per million living. Since then there has been a gradual diminution in this death-rate, until now the number of deaths is 40,000 per annum, or a death-rate of 1200 per million. It has been estimated that by 1930 the disease may be almost unknown. It is necessary to have compulsory notification, universal disinfection of houses in which cases of consumption have occurred, and isolation and sanatorium treatment on a large scale.

THE inaugural meeting of the Mining and Geological Institute of India was held at Assansol on January 16. A brief account of the origin and objects of the institute was given by Mr. W. H. Pickering, chief inspector of mines, to whom, with Mr. T. H. Holland, F.R.S., director of the Geological Survey, the institute owes its inception. The object of the new society is the promotion of the study of all branches of mining methods and of mineral occurrences in India, with a view to disseminate information obtained for facilitating the economic development of the mineral industries of the country. Mr. Holland was elected president, and in his presidential address, we learn from the *Pioneer Mail*, he pointed out the true relations between the science of geology and the art of mining. He dwelt upon the advancement made in recent years in scientific mining, particularly emphasising the need of cooperation in publishing the results of practical and scientific investigations. On the following day the meeting was closed by a banquet, when Sir Andrew Fraser expressed the hope that the institute would succeed in bringing the officers of the geological department, inspectors of mines, and also *ex officio* honorary members, into touch with the practical men belonging to the mining community.

DURING his Administratorship of Dominica and of the Leeward Islands, Mr. Hesketh Bell has been very actively engaged in an inquiry which has served to show that the West India islands are not so frequently visited by disastrous hurricanes as has been generally believed, and that the Press reports of the occurrences are almost invariably greatly exaggerated. Tropical hurricanes are annual phenomena in the south-western portion of the Atlantic, but it is only when the centre of one passes over or close to an island that much damage is done on land. Mr. Bell has found that between 1800 and 1875 the British islands in the Leeward group were visited by only seven hurricanes. As the popular error on this subject, and the highly coloured accounts of the disasters, militated seriously against agricultural enterprise in the islands—having proved powerful factors against the investment of capital, and rendering it difficult for landowners to raise loans, save on very onerous terms—Mr. Bell has submitted the whole of the facts to a leading London firm of insurance brokers, and the result has been the completion of a scheme of hurricane and volcanic eruption insurance for the West Indies, the rates quoted being 30s. per cent. on buildings, cultivations, and crops of all kinds, except bananas (the ratio of risk in this case not being yet ascertained), and 10s. extra per cent. for risks against volcanoes. The huts and small tenements of the very poor are not included in the scheme. These fragile structures, naturally, are the first to go down before the storm, but they are easily re-erected. Properly worked and supported, the scheme should result in a decided reduction in the loss from hurricanes, and the islands generally should benefit from the greater confidence and sense of security of investors.

MR. L. M. LAMBE has sent us a copy of a paper on new species of tortoises, referable to the living genus *Testudo* and the extinct *Bæna*, from the Oligocene of the Cypress Hills, Assiniboia. The original paper is published in the *Ottawa Naturalist* for January.

THE two articles forming the contents of the third part of vol. lxxx. of the *Zeitschrift für wissenschaftliche Zoologie* are of a nature which appeals to the specialist, and are too technical even to be summarised in our columns. In the one Mr. D. Tretjakoff treats of the front half of

the eye of the frog and its development, while in the second Messrs. Otto and Tönniges discuss the development of the pond-snail commonly known as *Paludina vivipara*.

WE have received an advance copy of the report of the Yorkshire Naturalists' Union for 1905, in which the appointment of Mr. W. E. Clarke, of the Edinburgh Museum, as president for the current year is announced. The union is in a flourishing condition, and carrying on its work with the usual vigour. Ornithologists will be pleased to learn that arrangements have been made for the publication, in two volumes, of a work on the birds of Yorkshire, at the price of one guinea to subscribers.

In a pamphlet issued by the Government Press at Calcutta, Mr. E. P. Stebbing describes certain bark-boring beetles which are inflicting much damage on the pine-forests of the Zhob district of Baluchistan. Chief among these is a species of the genus *Polygraphus*, which is described as new under the name of *P. trenchi*. Large numbers of dead and dying pines are to be seen in the forests, and it is considered probable that they are on the increase.

THE mode in which lungless (and gill-less) salamanders breathe forms the subject of investigations undertaken by Miss Seelye on *Desmognathus fuscus*, the results of these being published in a recent issue (vol. xxxii., No. 9) of the *Proceedings of the Boston Society of Natural History*. From this it appears that respiration is effected by means of the combined action of the mucous membrane of the pharynx and œsophagus, regulated by breathing movements of the nose and mouth, and of the skin.

A COPY of the "Naturalists' Directory" for 1906-7 has been received. While its usefulness cannot be denied, this little work stands in sore need of editing. To mention only a few instances, we find the names of the late Lieut.-General MacMahon, Dr. W. T. Blanford, and Mr. H. B. Medlicott figuring in the list of geologists (Dr. Blanford also in the zoological list), while the Duke of Bedford is referred to merely as an "F.L.S.," instead of as president of the Zoological Society. Expert assistance should be engaged before another edition is issued.

THE habits and distribution of the "false scorpions," Pseudoscorpionidæ, and more especially those of the species *Chelanops oblongus*, are discussed by Dr. Berger in vol. vi. of the *Ohio Naturalist*, the paper being reprinted as a Bulletin of the Ohio University. A figure and description of the curious "moulting-nests" of *Chelanops* are given. These, it seems, are not constructed by the female parent for her entire brood, but are made singly by each immature individual when the time for changing its coat arrives.

DEVELOPMENT and embryology from the evolutionary standpoint form the key-note of the contents of the first number of *Biologisches Centralblatt* for the current year, Mr. F. Dahl contributing a paper on the physiological importance of breeding-selection in its widest sense, as exemplified by spiders of the family Lycosidæ, while Mr. R. Kossmann emphasises the importance of favourable variations in influencing breeds and species, and Mr. Henriksen, in the first part of a dissertation on development from the functional point of view, urges that everything in nature tends towards a state of equilibrium peculiar to itself. In the last named article the author states he will "endeavour to show that the theory of the structure of germ-plasm [proposed] by Weismann is un-

necessary, and when worked out in details is quite absurd, and that we have no right to claim that the egg is some kind of a microcosm of the ontogeny and a short recapitulation of the phylogeny of the organism into which it develops.'

In the course of a paper on phosphorescent marine animals, published in the January number of the *Zoologist*, Prof. McIntosh states that there are four distinct modes in which the light is produced. First, there may be special cells which secrete, in certain circumstances, phosphorescent mucus. Secondly, special cells may be phosphorescent without the emanation of any visible secretion. Thirdly, light may be emitted without any differentiation of tissue under nervous action. Fourthly, the phosphorescence may be due to light-emitting bacteria. One of the most striking features connected with phosphorescence is the simplicity of the mechanism by which it is produced and the entire absence of heat. "Thus," writes the author, "the light of a firefly, or a *Pholas*, has no sensible heat, whereas a temperature approaching 2000° F. would be necessary to make it by the usual processes, except the Geissler tube. So impressed were Prof. Langley and Mr. Very with this feature that they contrast it with the enormous waste in all industrial methods of producing light. . . . The authors, in view of this remarkable light without heat of the animals just considered, are of opinion that there is yet hope of obtaining an enormously greater result than we do now in the production of light."

BULLETINS Nos. 31, 32, and 33 (May and June, 1905) of the Bureau of Government Laboratories, Manila, have reached us. Bulletin No. 31 contains notes on a case of hæmatochyluria with observations on the embryo nematode, *Filaria nocturna*, by Drs. Wherry and McDill, and a research on the indol and cholera-red reactions by Dr. Wherry. Bulletin No. 32 deals with amœbic dysentery and amœbiasis, three articles being contributed by Drs. Strong, Thomas, and Woolley and Musgrave. Bulletin No. 33, by Dr. Herzog, records further observations on fibrinous thrombosis in the renal vessels in bubonic plague. The bulletins are well printed and well illustrated, and contain contributions of importance to medical science.

THE *Bulletin of the Johns Hopkins Hospital* for January (xvii., No. 178) is an excellent number. Dr. Harvey Cushing contributes an interesting and well illustrated article on Dr. Garth, the "Kit-Kat" poet. Garth was the single medical member of the famous Kit-Kat Club, and besides being distinguished in his profession and delivering the Gulstonian lectures and Harveian oration at the Royal College of Physicians, London, published many poems, the most important of which is "The Dispensary." Born in 1661, he died in 1718, and is buried at Harrow. Other articles are the relationship of the State to the tuberculosis question, by Dr. John Foster; a method of estimating the opsonic content of the blood, by Drs. Simon and Lamar; tropical splenomegaly, by Drs. Musgrave, Wherry, and Woolley; reports of societies, reviews, notes, &c.

THE *Bulletin of the Department of Agriculture, Jamaica*, for December, 1905, contains articles on rubber cultivation relating the progress made in Ceylon and south India, also a caution to planters with reference to the appearance of a cocoa disease caused by the fungus *Phytophthora omnivora*.

FROM the review of the teak timber trade in Burma, contributed by Mr. T. A. Hauxwell to the *Indian Forester* (November, 1905), it is seen that in the last fifteen years

imports from Burma into Europe have diminished about 50 per cent., and prices have risen from 11*l.* to 15*l.* per ton; imports to India, where the standard of requirement is lower, show only a small decrease. The timber is extracted either by Government agency or by private lessees, the advantages in the latter case being that all marketable produce is extracted, and that the lessees have to share the risks, in connection with which the cost of elephants is a serious item.

In the British West Indies, Jamaica easily leads the way in the cultivation of tobacco, but Trinidad also received an award at the recent Colonial and Indian Exhibition, and it is probable that good results may be obtained in certain parts of the other islands. A useful handbook to the cultivation and curing of tobacco has been issued by the Imperial Department of Agriculture as No. 38 of the pamphlet series. Mr. T. J. Harris gives a detailed and practical account of cultivation in the open and of curing the leaf, based on his former experience at the Hope Gardens, Jamaica, and Mr. W. N. Cunningham, who succeeded him, writes on tobacco-growing under shade.

OUR knowledge of the manner in which plants can receive external stimuli has been greatly extended by recent work, notably by the researches of Prof. Haberlandt. It is interesting to find that Prof. Schwendener has recorded his views on the subject in *Naturwissenschaftliche Wochenschrift* (January 2). In connection with the statolith theory of geotropism, a neat experiment is adduced as proof that can easily be put to the test. Ordinarily, if the root of a seedling is placed horizontal, curvature will ensue only after a definite lapse of time; assuming that starch grains take some time to react, it may be possible to reduce the interval by shaking or tapping the root. *Fiat experimentum*. The article also discusses the focusing action of certain epidermal cells of the leaf, and the mechanical feelers in the shape of hairs or papillæ that are possessed by insectivorous plants, the stamens of *Berberis*, and of the *Cynareæ*.

In the *Proceedings of the American Academy of Arts and Sciences* for December, 1905, Mr. A. L. Rotch gives an account of the first observations with registration balloons in America. Although the successful experiments at Blue Hill led to the extensive use of kites for meteorological observations in other countries, unmanned balloons were not employed in America until 1904, when the author was enabled to make a series of four ascents at St. Louis in September of that year; at the maximum height, 10½ miles, a temperature of -62°·5 F. was recorded. Another series of ten ascents was made in the latter part of November and the first part of December, mostly after sunset, to avoid possible effects of insolation. Two of these balloons travelled with a mean velocity of more than a hundred miles an hour. An extreme height of nearly 10 miles was attained, with a temperature of -72°·4 F.; and a reading of -76°·2 was once recorded somewhat below 7 miles. In order to continue these observations during the winter, Mr. Rotch made a further series of nine ascents during the latter part of January, 1905. On January 25 the extraordinarily low temperature of -111° F. was registered at the height of about 9 miles, during the prevalence of a high barometric pressure at the ground. A complete publication of the results will be made in the *Annals of the Astronomical Observatory of Harvard College*.

AN interesting pamphlet on the climate of St. Moritz has been published by Dr. A. Nolda, resident physician, with the collaboration of Mr. C. Bühner, director of the meteorological station at Montreux. The object of the paper is to show the claim of St. Moritz to be considered as a desirable health resort, and the meteorological statistics in support of this view are taken from those published by the Swiss Meteorological Institute in 1890-1 and 1900-4 inclusive; they are therefore entirely trustworthy. The village of St. Moritz is in the valley of the Upper Engadine, and the meteorological station has an elevation of 6040 feet. The characteristic features claimed for the station are:—a dry air, clear sky, high solar radiation, low humidity and rainfall, and almost complete immunity from summer and winter fogs; these advantages seem to be fully borne out by the official meteorological reports. The mean monthly temperatures are:—January, 19°·7 F.; July, 53°·8; the mean monthly extremes are:—January, -2°·5, 39°·7; July, 39°·9, 72°·7; the absolute extremes:—January, -15°·1, July, 76°·8. The mean annual humidity is 67 per cent.; on some days the atmospheric moisture falls to a point unknown in the lowlands of temperate latitudes; in 1900-4 instances are recorded of 10 per cent. to 16 per cent. The mean annual rainfall is 35·2 inches; rain and snow fall on an average on 128 days, and if we deduct the days when less than 0·04 inch fell, only 104 really rainy days remain. Compared with other places this is a very small number.

A copy of the *University of Colorado Studies* (vol. iii., No. 1), has reached us, containing brief historical, literary, psychological, and sociological articles by members of the university staff, a paper on extinct glaciers of Colorado by Mr. Henderson, and contributions to the natural history of the Rocky Mountains by Prof. T. D. A. Cockerell, in which several new insects and plants are described.

WE have received reprints, from the Bulletin of the Museum of Comparative Zoology at Harvard (Geological Series, vol. viii., Nos. 1 and 2), of two papers by Prof. W. M. Davis. One, on the Wasatch, Canyon, and House Ranges, Utah, is a continuation of a paper on the mountain ranges of the Great Basin. The other deals with the glaciation of the Sawatch Range, Colorado.

THE *Engineering and Mining Journal* of New York for January 6 contains carefully estimated statistics, compiled by prominent authorities, of production of the more important ores, minerals, and metals in the United States during 1905. The productions of iron, copper, lead, zinc, gold, and silver have all increased over 1904, and the outputs have been the highest recorded.

THE introduction of reinforced cement marks a new epoch in the history of building, and an interesting account of some of the results achieved is given in the *Journal of the Franklin Institute of Philadelphia* for January. One of the most remarkable applications is the use of reinforced cement for the construction of dams. This method of building a permanent masonry dam at a comparatively low cost has already rendered financially practicable the utilisation of many water-power sites which otherwise would have been neglected.

IN the *Bulletin de la Société d'Encouragement* of December 31, 1905, Dr. L. Guillet gives the results of a careful study of the nickel-vanadium steels. He prepared at the Imphy Steel Works nickel-steel alloys containing 0·2 per cent. and 0·8 per cent. of carbon, and of each series he selected a pearlitic steel, a martensitic

steel, and a γ -iron steel, to which he added vanadium in proportions varying from 0·2 per cent. to 7 per cent. The effect of the addition of vanadium is to increase the elastic limit, very considerably in the case of the pearlitic steels. In other cases the increase is insignificant.

WE have received from Mr. C. F. J. Galloway a useful paper contributed by him to the *Proceedings of the South Wales Institute of Engineers* (vol. xxiv., No. 6). It describes an application of the Brandt carriage and hydraulic column, successfully employed with hydraulic rock drills in the Simplon Tunnel, at a colliery in South Wales in conjunction with compressed-air rock drills. It proved one of the simplest and best forms of carriage for rock drills hitherto used. Full details of the work done and of the cost of the whole equipment are given.

IN the *Transactions of the Institution of Engineers and Shipbuilders in Scotland* (vol. xlix., part iii.) there is an interesting paper by Mr. R. M. Neilson on the evolution and prospects of the elastic fluid turbine. Steam is not the only possible elastic fluid for a turbine; and the much greater ranges of temperature with the same range of pressure obtainable by the employment of other fluids instead of, or in conjunction with, steam deserve serious consideration. Much time has been spent on matters relating to elastic fluid turbines, and a large proportion of it has been devoted to inventions intended to be of a revolutionary nature with little knowledge of what had already been tried by others. The historical sketch of elastic fluid turbines given by the author is consequently most instructive. After an account of the early machines deserving the name of turbine, he describes and illustrates the turbines of Kempelen (1784), Gilman (1837), Vilbrow (1843), Wilson (1848), Fernihough (1850), Wertheim (1877), and De Laval (1882, 1889). The descriptions given of the turbines at present constructed show that although they differ among themselves very considerably, there is a visible tendency of the different types to approach each other. The preliminary experimental stage of the gas turbine has not yet been passed, and it cannot at present be said whether or not it ever will. An efficient gas turbine, which is a turbine both as regards the motor and the pump, seems to depend upon the obtaining of an efficient turbine compressor, or other form of rotary pistonless compressor. In order to determine whether the gas turbine had any reasonable chance of success in the near future, experimental research was needed as to the losses in pneumatic compression to high pressures, the expansion of hot gases in divergent nozzles, the transference of heat from gases to metals at high temperatures and very high velocities, and the oxidation of turbine blades when exposed to the action of air, steam, and carbon dioxide at high temperatures.

IN several notices in these columns attention has been directed to the necessity of investigating mathematically the motions of aéroplanes and aërocurves as affording the only effective method of dealing with the problem of stability. A remarkably complete investigation on these lines is given in the *Revue d'Artillerie* for October and November, 1905, by Captain Ferber, who has been assisted in some of the calculations by M. Maillet. The method of treating the problem of longitudinal stability by considering the small oscillations about a steady state had been previously worked at (Bryan and Williams, *Proc. Roy. Soc.*, vol. lxxiii.), but owing to the appointment of the second of these authors to a research studentship, want of time rendered further progress impossible. The problem was then taken up by Captain Ferber, of the French

Artillery, who has given a masterly discussion of not only longitudinal but also lateral stability, and has arrived at a large number of important simple and practical conclusions relating to both the conditions of stability and the trajectories of aeroplanes the motion of which is stable. The paper constitutes by far the most important recent advance in the study of artificial flight.

MESSRS. PERCIVAL MARSHALL AND CO. have published a popular essay entitled "Electric Power. What it is and what it can do," by Mr. Alfred W. Marshall. The price of the pamphlet is 3d. net.

MR. NASARVANJI JIVANJI READYMONEY has issued a revised edition of his "Nature-history Museum and Descriptive defining Nature-history Tables," the first edition of which was noticed in our issue for March 30, 1905. Several changes and additions have been made in this painstaking piece of work.

Nos. 16, 17, and 18 of "Materials for a Flora of the Malayan Peninsula," by Sir George King, F.R.S., and Mr. J. Sykes Gamble, F.R.S.—which Messrs. West, Newman and Co., of Hatton Garden, are reprinting from the *Journal of the Asiatic Society of Bengal*—have been received. In addition to an account of the rubiaceous genus *Psychotria*, the first fasciculus contains descriptions of the Malayan members of eleven natural orders, including 48 genera and 81 species, of which two genera and 17 species are new to science. The second of the present parts describes five natural orders, Myrsinaceæ, Sapotaceæ, Ebenaceæ, Styraceæ, and Oleaceæ. These five orders comprise 24 genera and 221 species. There are no new genera, but the number of new species reaches 103. The last of the three instalments deals with nine natural orders containing 53 genera and 150 species, none of which are described for the first time. Among the orders of which accounts are given may be mentioned Boraginaceæ, Convolvulaceæ, Solanaceæ, Scrophulariaceæ, and Lenticulariaceæ. When all the fasciculi are available, we hope to review the complete work.

THE Cambridge University Press is publishing, under the title of "Cambridge Tracts in Mathematics and Mathematical Physics," a series of short works on various topics in pure mathematics and theoretical physics. The chief purpose of the undertaking is to assist in the maintenance of a high standard in English mathematical teaching by the continued infusion of new methods and more accurate modes of treatment, and by the extension of knowledge of recent mathematical research. The first of the series, a tract on "Volume and Surface Integrals used in Physics," by Mr. J. G. Leatham, has already been published, and a second, on "The Integration of Functions of a Single Variable," by Mr. G. H. Hardy, will be issued very shortly. The Press has also ready for immediate publication a new and revised edition, in one volume, of Prof. A. E. H. Love's "Treatise on the Mathematical Theory of Elasticity," and a third edition of Prof. Horace Lamb's "Hydrodynamics."

THE fourth year-book, that for 1905, of the Carnegie Institution of Washington has been received. The titles alone of the publications bearing upon the work done under grants from the institution fill eight closely printed pages, and it is impossible here to do more than direct attention to a few of the researches of outstanding importance. Prof. G. E. Hale, as director of the solar observatory at Mount Wilson, California, provides an excellent illustrated account of the astrophysical work done at Mount

Wilson under his supervision. Prof. Lewis Boss, director of the Dudley Observatory, Albany, New York, describes his investigations of stellar motion. Mr. Charles B. Davenport, who is in charge of the station for experimental evolution at Cold Spring Harbour, New York, classifies the work in progress there, which is largely what he describes as of the "time-consuming" order, and gives a full report, with illustrations and results, of the experiments conducted during the year. Marine biology is well represented in the year-book by Mr. A. G. Mayer's account of what has been accomplished in connection with the laboratory at Tortugas, Florida. This report includes contributions from the numerous experts working in the laboratory. Several investigators were at work in the Desert Botanical Laboratory, Tucson, Arizona, and substantial progress in numerous directions was made during the year. Prof. T. C. Chamberlin, of the University of Chicago, continues his contributions to solutions of the fundamental problems of geology, and gives a full discussion of the deformations of the earth and of climatic oscillations. Mr. Bailey Willis, of the U.S. Geological Survey, describes his geological studies in Europe, and his attempts to determine the geographical condition of each continent at successive geological epochs. The magnetic survey of the North Pacific Ocean, undertaken by the U.S. Department of Research in Terrestrial Magnetism, and carried out by Mr. J. E. Pratt's party in the *Galilee*, is described by Dr. L. A. Bauer. These annual reports should be a source of gratification to Mr. Carnegie, and it is to be desired that wealthy men in this country could be led to follow an excellent example in the direction of encouraging scientific research and providing for the publication of results.

OUR ASTRONOMICAL COLUMN.

COMET 1905c (GIACOBINI).—The following is a continuation of the ephemeris published in No. 4067 of the *Astronomische Nachrichten* by Herr A. Wedemeyer:—

		Ephemeris 12h. M.T. Berlin.			
1906		α (true)	δ (true)	$\log r$	$\log \Delta$
		h. m. s.	° ' "		
Feb 8	...	23 31 16	... -21° 9'	9.7704	... 0.0694
10	...	23 49 14	... -19 40	9.8058	... 0.0755
12	...	0 5 58	... -18 7	9.8379	... 0.0830
14	...	0 21 33	... -16 33	9.8672	... 0.0918
16	...	0 36 3	... -14 59	9.8942	... 0.1016
18	...	0 49 32	... -13 26	9.9192	... 0.1123

The accompanying chart shows, approximately, the apparent path of the comet among the stars from

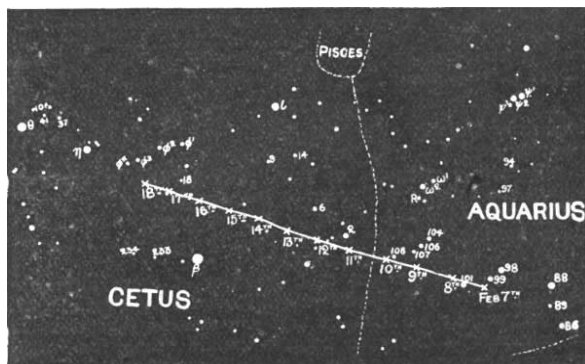


FIG. 1.—Apparent path of Comet 1905 c (Giacobini), February 7–18, 1906.

February 7 to February 18, according to the above ephemeris.

Although still fairly bright, the comet is a difficult object